Fireproof Precast Element With Securement Structure

Field of the Invention

The present invention relates in general to fireproof elements. In particular, the present invention relates to precast concrete stay in place elements to fireproof structural steel.

Description of Background Information

There are currently two methods for fireproofing structural steel with concrete. Both methods use a solid box profile to encase the structural steel 100 with the concrete 110. FIG. 1A illustrates a cross section of a solid box beam, whereas FIG. 1B illustrates a cross section of a solid box column. In one method, molds are used to form the desired profile of the concrete around the steel, where the concrete is poured in the mold and is allowed to harden. In the other method, some form of temporary screed is used to define edges of the desired profile, where the concrete is sprayed or troweled against the steel and is screeded off.

Brief Description of the Drawings

In the drawings, like reference numerals represent similar parts of the illustrated embodiments of the present invention throughout the several views wherein:

FIG. 1A depicts a cross section of a solid box beam;

FIG. 1B depicts a cross section of a solid box column;

FIG. 2 depicts one embodiment of a cross section of a precast element attached to one embodiment of a securement structure;

FIG. 3A depicts one embodiment of a cross section of a solid box beam with the precast element of FIG. 2; and

FIG. 3B depicts one embodiment of a cross section of a solid box column with the precast element of FIG. 2.

Detailed Description

The disadvantage of the molding method, discussed above, is that the projecting shear tabs or clips used to attach the steel members together require that the mold be penetrated. As a result, the molding method is labor intensive and requires the mold to be repaired if it is to be reused. The disadvantage of the sprayed or troweled method, discussed above, is that the edge screeds must be attached and removed and require extensive cutting and fitting.

One embodiment of an apparatus of the present invention provides several advantages over currently known approaches, for example, for encasing structural steel with concrete for the purpose of fireproofing. The apparatus may include one or more elements (e.g., precast corner elements and/or precast beam elements with or without concrete) and one or more securement structures (e.g., clamps), for example, to attach the elements to structural steel (e.g., structural steel flange). The elements may be precast elements and may include hardened concrete.

The one or more clamps may be integrated with the one or more precast elements. FIG. 2 illustrates one embodiment of a cross section of a precast element 200 attached to one embodiment of a clamp 210. The precast element may include (i) flat top 220 and bottom 230 surfaces and/or (ii) two substantially flat vertical surfaces 240 extending from the edges of the top surface to the edges of the bottom surface. A series of clamps (e.g., beam clamping structures) may be spaced along the length of the precast element and may project out of the top surface of the precast element. The clamps may facilitate attachment of the precast element to the structural steel (e.g., the structural steel flange edge).

The precast elements may form the edges of the desired profile of the concrete encasing the structural steel. FIG. 3A illustrates one embodiment of a cross section of a solid box beam with the precast elements 200, whereas FIG. 3B illustrates one embodiment a cross section of a solid box column with the precast elements 200. An edge of the precast elements may include an edge chamfer 250 if it is desired on the final profile of the concrete encasement.

The precast elements may provide fireproofing protection for the portion of structural steel 100 adjacent to the precast elements. The precast elements (e.g., edges) may also be attached to structural steel 100 to serve as a leave-in-place screed to apply concrete 260 to the structural steel to protect the steel from fire and/or provide a desired encasement profile of the structural steel. The concrete may be poured, sprayed and/or troweled onto the structural steel to fill the areas between the precast elements and may be allowed to harden. One or more surfaces of the precast elements may serve as a screed

guide so as to establish the location of the surfaces of the poured, sprayed and/or troweled concrete infill material.

The precast elements may allow the steel encased in concrete to be provided without the use of molds. By eliminating the mold, projecting elements may be easily accommodated without concern for cutting and later repairing the mold. Also, because the precast elements (e.g., precast concrete corner elements) may stay in place, most temporary edge screeds may be eliminated and the precast elements may serve the screed function. Also, the precast elements may work equally well with poured, sprayed and/or troweled application of the remaining concrete.

Another embodiment of an apparatus includes a precast element and a securement structure. The precast element may include a fireproof material (e.g., concrete) and may be configured to serve as a screed guide (e.g., a temporary and/or stay-in-place screed guide).

The precast element may include (i) a top surface including a flat portion, (ii) a bottom surface including a flat portion, and (iii) first and second side surfaces extending from the top surface to the bottom surface. The first side surface of the precast element may be non-parallel relative to the second side surface of the precast element. The flat portion of the top surface of the precast element may be substantially parallel with the flat portion of the bottom surface of the precast element. The precast element may also include a chamfer.

The securement structure may be permanently and/or releasably attached to the precast element and may project out of the top surface of the precast element. The

securement structure (e.g., one or more clamps) may be configured to permanently and/or releasably secure the precast element to a beam and/or a column (e.g., a steel element). The beam and/or the column may include an I-shaped cross-section.

The precast element may serve as a screed and/or may form an edge so as to apply a fireproof material (e.g., concrete) to the beam and/or a column to protect the beam and/or a column from fire. The fireproof material may be poured, sprayed and/or troweled to the beam and/or a column. The precast element itself may also provide fireproofing protection to the beam and/or the column.

The foregoing presentation of the described embodiments is provided to enable any person skilled in the art to make and use the present invention. Various modifications to these embodiments are possible, and the generic principles presented herein may be applied to other embodiments as well. As such, the present invention is not intended to be limited to the embodiments shown above, and/or any particular configuration of structure but rather is to be accorded the widest scope consistent with the principles and novel features disclosed in any fashion herein.